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SMALLPOX AND VACCINATION *

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SMALLPOX has been known from the earliest ages, existing in China many centuries before Christ. It was introduced into Europe by the Crusaders, and early in the sixteenth century into America by the Spaniards. A study of the disease was made by Sydenham early in the seventeenth century, and his writings are still considered good authority.

Osler says: "Smallpox is an acute infectious disease, passing through the stages of papule, vesicle, pustule, and crust. The mucous membrane is usually affected. Severe cases are complicated with cutaneous and visceral hemorrhage."

Smallpox is caused by a specific poison whose nature remained obscure until May, 1903, when Professor W. T. Councilman announced his discovery of the organism, a protozoan, at present unclassified, with a definite cycle of development consisting of two stages: In the first stage the organism is extranuclear and presents itself as a small, homogeneous body in the protoplasm of the epithelial cell; with growth the body becomes irregular in outline and resembles an amœba; with age it breaks up into numerous dots or rings. This closes the first stage in the life of the protozoan. The newly formed bodies may repeat the first stage by infecting other cells, or may enter the nucleus and pass through the second stage, which is looked upon as sexual. The first stage is supposed to be characteristic of vaccinia and cowpox, while in smallpox both stages are found together.

The spores are found in countless numbers in the ripe pustule, and when the latter dries and falls off may be widely scattered.

The disease is common to all ages and conditions, and is usually

* Read at a meeting of the Alumnæ Association of the New England Hospital.

fatal in children and the pregnant. In the Montreal epidemic of 1885 eighty-six per cent. of the cases were children under ten.

Boston reports a preponderance of male over female cases, owing, possibly, to the greater exposure of men employed in shops and stores.

In Pittsburg during the winter of 1892–3 most of the cases occurred in young men, who came to the city for employment unprotected by vaccination.

SYMPTOMS.

The period of incubation is from twelve to twenty days. Most cases develop on the fourteenth day. During this period there may be lassitude, but no other symptom.

The period of invasion is ushered in with chills, severe headache, backache, insomnia. Temperature, 101 to 105° F. Pulse rapid; constipation; tongue dry, and often sore throat.

The eruption appears on the third or fourth day, beginning as macules, first appearing on the forehead and hands; in several hours the eruption will have spread rapidly. With the appearance of the eruption there is a lessening of fever and other symptoms.

On the fifth to the sixth day the macule becomes a vesicle, which in time is umbilicated; at this stage there is intense burning and itching.

On the eighth day the vesicle becomes a pustule; at this stage there is a rise of temperature and delirium is often present; this is the critical stage, and many complications may arise.

In favorable cases the secondary fever lasts about forty-eight hours, when it subsides, the pustules rupture, and desiccation begins. Convalescence is established between the third and fourth week.

Death results from action of the poison on the nervous system, usually at the end of the second week or at the height of the eruption. Those suffering from the hemorrhagic type may die before the rash develops. The contagium develops in the system and is found in the pustules, secretions, and exhalations of the lungs.

The dry scales are an important element of danger. The disease is said to be contagious from the early stage, although it has not been determined whether the contagium is active before the eruption develops. Some authors believe that there is little danger during the early stage. Smallpox occurring in the wards of general hospitals and cared for by the nurse until the appearance of the eruption without becoming infected would be an argument in favor of the latter opinion.

The disease is spread by contact, direct or indirect, through letters and money, clothing, air, insects, and domestic animals.

Some of the complications are pneumonia, bronchitis, and rheumatism; keratitis is frequent, and cellulitis and abscess are frequent sequelæ.

There are four varieties of smallpox: discrete, confluent, hemorrhagic, modified smallpox or varioloid.

In the discrete form the eruption is well separated and the papules are few in number; in the confluent the eruption is so thick that large masses are formed, the surface is much swollen, and when desquamation takes place the crust often takes the form of a mask. In the hemorrhagic form the surface is blue, and this form is always fatal. Varioloid is smallpox modified by vaccination. The symptoms are not severe and the eruption is light.

There exists another form,—a rare condition,—namely, the patient passes through the prodromal and incubation period, and when the eruption should make its appearance there is an absence of it and rapid recovery.

TREATMENT AND PREVENTION.

First. Protection by Vaccination.—Inoculation was introduced into Europe in 1718 by Lady Mary Wortley Montagu and into America in 1721 by Dr. Boylston, of Brookline, who inoculated two hundred and forty-seven persons. For this practice he was threatened with hanging. Colonial history contains many allusions to letters congratulating friends on their successful recovery from smallpox after inoculation. The Rev. Cotton Mather extolled the practice from the pulpit, and a nephew of the divine, a physician of Dorchester, was almost mobbed for advocating the measure. This occurred eighty years before the discovery of vaccination, the discovery of which has made Dr. Edward Jenner's name immortal.

Jenner's attention was first called to the subject by the remark of a milkmaid, who said, "I can't take smallpox, for I have had cowpox;" this was the prevailing idea among the country people, and was the beginning of investigations covering a period of twenty-two years, and resulting in one of the most important discoveries of preventive medicine. Before Jenner's discovery every tenth death was due to smallpox and one-fourth of the people were disfigured by it. James Phipps, a boy of eight years, was the first person vaccinated by Jenner. The virus used was taken from a vesicle on the hand of a milkmaid named Sarah Nelms, who had been accidentally infected while milking a cow. This occurred on May 14, 1796, a day annually set apart as a holiday in Germany in commemoration of the discovery. In July of the same year Jenner tested the efficacy of this vaccination by inoculating the boy with smallpox matter taken from a patient suffering with that disease, but no result followed. He was inoculated with smallpox matter as often as twenty times, and was found to be immune each time.

Vaccination was introduced into America by Dr. Benjamin Water-

house, of Boston; he vaccinated his son on July 8, 1800, the first person vaccinated in America.

President Thomas Jefferson devoted time and money to the spread of the discovery in the Middle South.

A study of health reports will convince the skeptic that vaccination has been of untold value in saving life.

The Municipal Hospital of Philadelphia reports that of its twenty-six hundred smallpox patients of the last two years not one had been successfully vaccinated.

According to the Boston Health Report smallpox prevailed to a greater extent in 1901 than at any other time since the winter of 1872–3, when during about eight months more than one thousand deaths resulted. From 1840 to 1873 there were in Boston two thousand nine hundred and forty-three deaths from smallpox, an annual average of 89.33. From 1874 to 1900 there were but sixty-three deaths, an average of 2.33. During these twenty-seven years of relief vaccination was neglected, and few physicians became sufficiently familiar with the disease to recognize it, even in mild form.

With the exception of a little flurry of smallpox in 1894, when a moderate amount of vaccination was secured, this prophylactic measure had been but moderately used, so that the larger portion of the people were in a receptive condition for the disease. Another factor in spreading the disease was the mildness of the attack, many of the cases being unrecognized and not reported.

The disease appeared in mild form in May, and was not recognized until several severe cases had resulted. Within forty-eight hours twelve cases were removed to the hospital. This outbreak was soon ended, but another and another occurred in different parts of the city. All known cases were quickly removed to hospital and all precautions taken. In spite of preventive measures, the number of cases increased to twelve in August, thirty in September, forty-nine in October, one hundred and ninety-five in November, two hundred and ten in December, and one hundred and seventy-seven in January. Total from February 1, 1901, to February 1, 1902, four hundred and one males and two hundred and eighty females, or six hundred and eighty-one cases. All but five of these were removed to hospitals. 15.85 per cent. resulted in death. Four of the five treated at home died. Of the six hundred and eighty-one cases two hundred and ninety-two showed evidences of vaccination; three hundred and eighty-nine showed no evidences of vaccination. Number of deaths among vaccinated, twenty-seven; number of deaths among unvaccinated, eighty-one.

During this time the Board of Health through the press and let-

ters to railroad companies, mercantile and other establishments, advised vaccination. On December 26 orders were issued for the vaccination of all inhabitants of Boston. The number vaccinated was four hundred and eighty-five thousand.

In Pittsburg, Pa., during the past year 80.53 per cent of the cases of smallpox were unvaccinated. Of eight hundred and fifty-three cases reported one hundred and twenty-one were below six years of age and six from six to sixteen years.

A Montreal health report shows that smallpox prevailed from 1870 to 1875. Animal vaccination was practised and the city was free until 1885. Gradually vaccination fell into bad repute, and for ten years the population was unprotected, when a case was imported from Chicago, which became the nucleus of an epidemic causing in nine months three thousand one hundred and sixty-four deaths.

In Germany, where smallpox had decimated the population, thorough vaccination has practically stamped out the disease.

Every nurse should become familiar with the technique, after-care, and phenomena of vaccination.

The hands of the operator and the skin of the patient should be surgically clean, and a sterile instrument should be used for scarification. The arm of the patient should be scrubbed with soap and water and alcohol. A shield may be used until the vaccine is dry and for the first twelve hours; this may then be replaced with a sterile gauze dressing held in place with adhesive plaster or collodion or a cotton cocoon. Oil should not be applied. Dry powder will often relieve the itching.

The third day after vaccination a papule will appear. This is followed by a vesicle with depression, and again by a pustule with a reddish areola. By the fourteenth day a scab is formed, which is detached about the twenty-first day. There may be severe constitutional symptoms ranging from a slight malaise to severe pain, high temperature, rash, and prostration. Should there be undue swelling with pus, the wound should be treated as in other surgical conditions.

During the years 1901–2 some cases of tetanus appeared in the vaccinated, and several of these were attributed to impure virus. The matter was investigated by Dr. McFarland, of Philadelphia, who reported that "Tetanus is not a frequent complication, and is to be avoided by using greater care in the preparation of the vaccine virus."

Dr. T. M. Rotch says, "Vaccination should be done about the age of three months, avoiding the dental period, and repeated at puberty."

In smallpox epidemics vaccination should be practised until vaccinia results; an old vaccination will not secure immunity.

Vaccination in the prodromal stage of smallpox or after exposure

will often result in a mild case. But few cases appear in almshouses, general hospitals, and similar institutions where vaccination is compulsory.

The treatment of the patient is largely symptomatic. Diet, as in all septic conditions, should be very nutritious and digestible. It may consist of milk, eggnogg, strong broth, and beef-juice; gruel, to which should be added juicy fruits; oatmeal- and barley-water and large quantities of pure, cool water. Coffee often is useful for a stimulant.

Osler uses baths, cold and tepid, sponge and tub, to maintain cleanliness, lower temperature, and lessen delirium. Some physicians omit to prescribe baths; they say the crust disappears more rapidly if kept dry. The face, neck, and hands are sometimes covered with lint wet in a weak disinfectant, which may be warm or cold.

The treatment of cases in the Municipal Hospital in Pittsburg may be divided into elimination and stimulation. From the first the bowels are opened with salines and the kidneys by diuretics. Whiskey and strychnia are used for stimulation. Heart stimulants are used when indicated. The eyes are put at complete rest with atropine, and at the earliest symptoms of ulcer hot compresses are applied; usually the eye symptoms subside with faithful treatment, but the care of the eyes is an important factor in the nursing of this disease. Mouth, throat, and nostrils are kept clean with sprays and gargles. Carbolated vaseline is used ad lib. to relieve the itching. Disinfectants, usually coal-tar products, are used to disinfect floors, vessels, etc.

The patient is brought to the hospital in the ambulance upon the bed upon which he has been ill. When the patient has been put in bed, his bed, clothing, etc., are put into a specially constructed sterilizer and subjected to both steam and dry heat. Clothing worn by the patient is usually destroyed, and when the patient leaves the hospital he is provided with suitable clothing. Great care is taken to remove the dry particles of skin. This is a very tedious procedure and also important. Before being dismissed from the hospital patients are given several antiseptic baths, and alcohol is freely used to cleanse the skin.

The Philadelphia Health Department removes the inmates of infected houses to the Municipal Hospital. They are first taken to a room where all their clothing is removed. The body is then cleansed by a special bath, and they are passed to a third room, where the garments, now thoroughly disinfected, will be returned to them. They are then vaccinated and allowed to go at pleasure. If vaccination is refused, the usual quarantine is enforced.

The disinfectors are sent to the infected houses with cultures of smallpox, scarlet fever, and diphtheria. These are placed in inaccessible

places. The house is sealed and the disinfecting gas applied. After the proper time the cultures are examined by the bacteriologist, and if there is any trace of life the disinfection is not considered perfect.

Unless fumigation is done perfectly it is worse than useless, for it gives a false sense of security.

The nurse called to care for those suffering from this disease should be an immune or protected by vaccination. She should be in perfect health and able to carry out the technique usually employed for contagious cases.

Sheets, towels, and personal linen should be first disinfected with carbolic and then boiled one hour. Sweeping should be done with a broom covered with a cloth wet in disinfectant solution. The cloth and sweepings should be burned at once; handkerchiefs, dressings, and uneaten food may also be burned.

Secure good ventilation, but protect the patient from draughts. Strong sunlight should be excluded, and the patient's eyes further protected by dark glasses and screens about the bed.

If the patient is delirious, cover the hands with mittens to keep him from scratching.

The odor is best combated with carbolic or some of the preparations of phenol.

Nothing must be removed from the room until disinfected or fumigated. Sheets wet in carbolic may be hung at the doors.

"The cost of an epidemic of smallpox is incalculable. Much must be expended for ambulance and hospital service, house disinfection, and quarantine of exposed persons and public conveyances."

The loss to private and national wealth can hardly be computed. The State fixes the cost of one life at five thousand dollars. The greatest loss is that life itself and the great number of those who are made infirm, blind, and crippled.

THIRTY YEARS OF PROGRESS*

By LINDA RICHARDS

We this evening celebrate the thirtieth anniversary of this Training-School, of the Massachusetts General Hospital, and you have conferred upon me the honor of saying a few words to you upon this happy occasion. I have been asked to say something of what training-schools have accomplished in large general hospitals, of the work done in the small hospitals,

* An address given at the thirtieth anniversary of the organization of the Training-School of the Massachusetts General Hospital.